

Speech Studio Analyses

Definitions

Lx	Laryngograph output waveform
Tx	Fundamental periodic time of excitation
Fx	Fundamental frequency of excitation = $1/Tx$
Sp	Speech pressure waveform – microphone output waveform
Ax	Amplitude of Sp
CP	Vocal fold closed phase time
Qx	Vocal fold closed quotient $(CP/Tx) \times 100\%$

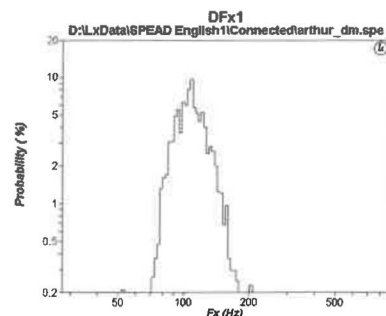
Connected Speech Analyses

In the following graphs all parameter values are placed in a 'bin' which defines a range of values. For distributions the bins increment in 3% steps i.e. a $\frac{1}{4}$ tone. For scattergrams the bins increment in 6% steps. For superimposed plots first-order is red, second-order is black. The aspect of voice which each analysis describes is shown in capitals.

DFx1 First order distribution of fundamental frequency.

Probability histogram for the frequency of every vocal fold cycle during voiced speech.

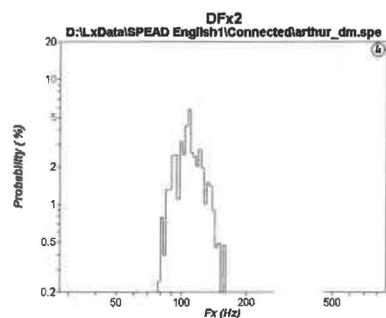
PITCH



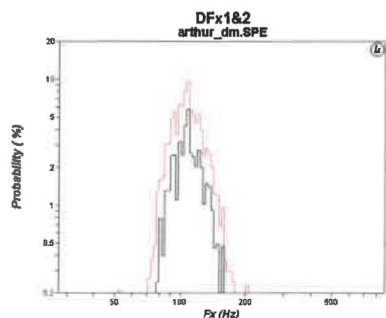
DFx2 Second order distribution of fundamental frequency.

Probability histogram for consecutive pairs of Fx values which fall in the same histogram 'bin'.

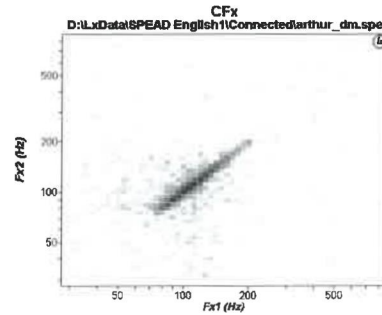
PITCH REGULARITY



DFx1&2 The first and second order distributions of fundamental frequency are superimposed on one graph.

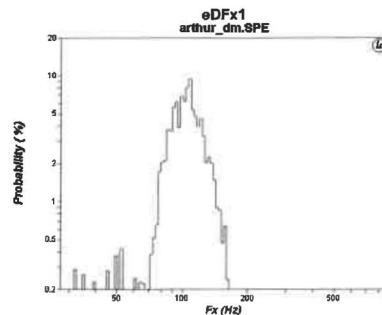


CFx Frequency cross plot
Scattergram of the frequency of every vocal fold cycle vs the frequency of the succeeding cycle. Irregularity score (connected speech jitter) in %.



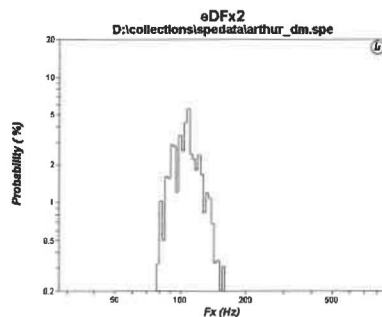
PITCH REGULARITY

eDFx1 First order elapsed time distribution of fundamental frequency.
Probability histogram for the frequency of every vocal fold cycle during voiced speech. The elapsed time distribution takes into account the amount of time each cycle occupies so lower frequencies have proportionately more effect.



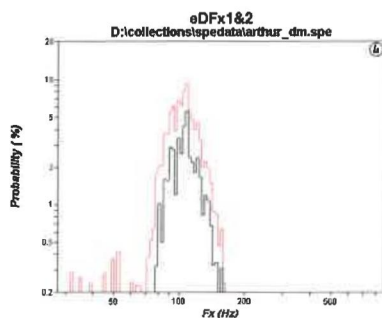
PITCH

eDFx2 Second order elapsed time distribution of fundamental frequency.
Probability histogram for consecutive pairs of elapsed Fx values which fall in the same histogram 'bin'.



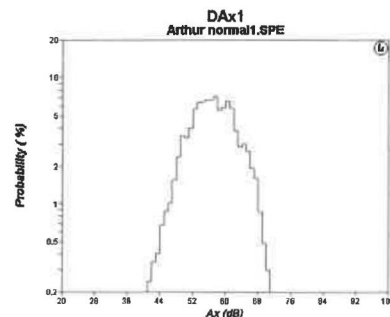
PITCH REGULARITY

eDFx1&2 The first and second order elapsed time distributions of fundamental frequency are superimposed on one graph.



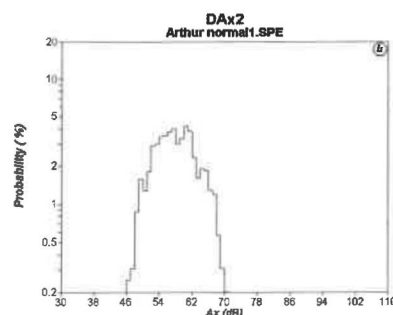
DAx1 First order distribution of amplitude.
Probability histogram for the peak value of Ax in each cycle.

LOUDNESS

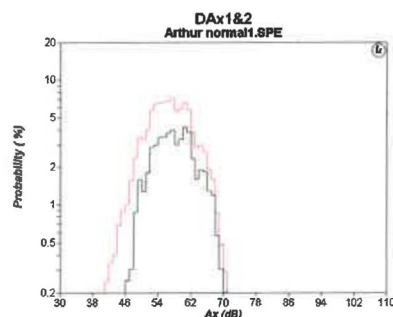


DAx2 Second order distribution of amplitude.
Probability histogram for consecutive pairs of Ax values which fall in the same histogram 'bin'.

LOUDNESS REGULARITY

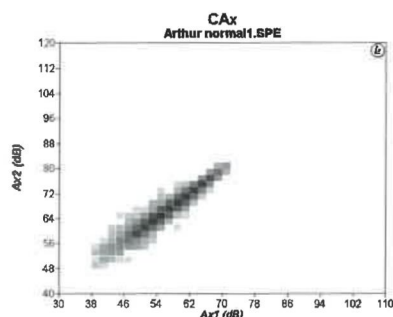


DAx1&2 The first and second order distributions of amplitude are superimposed on one graph.



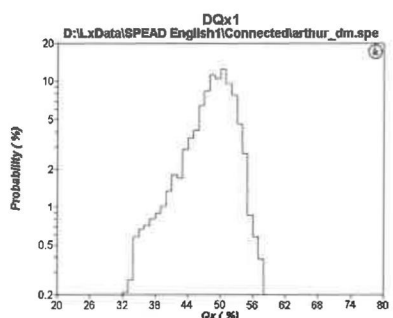
CAx Amplitude cross plot.
Scattergram of the amplitude of every vocal fold cycle vs the amplitude of the succeeding cycle. Irregularity score in %.

LOUDNESS REGULARITY



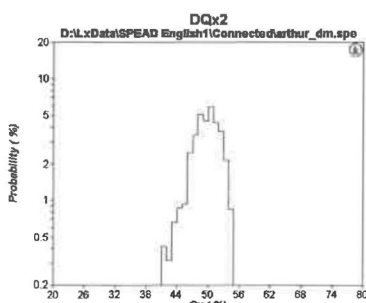
DQx1 First order distribution of closed quotient.
Probability histogram for the closed quotient of every vocal fold cycle

QUALITY

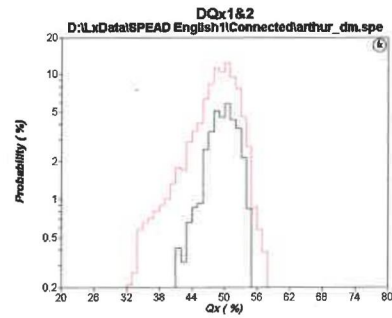


DQx2 Second order distribution of closed quotient
Probability histogram for consecutive pairs of Qx values which fall in the same histogram 'bin'.

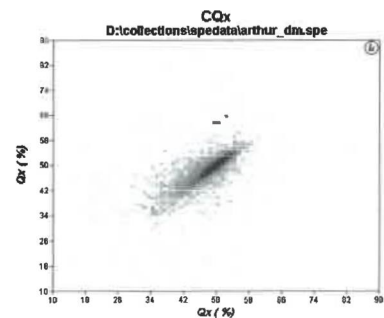
QUALITY REGULARITY



DQx1&2 The first and second order distributions of closed quotient are superimposed on one graph.

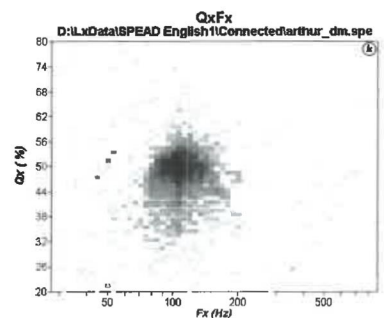


CQx Closed quotient cross plot.
Scattergram of the closed quotient of every vocal fold cycle vs the closed quotient of the succeeding cycle. Irregularity score in %.



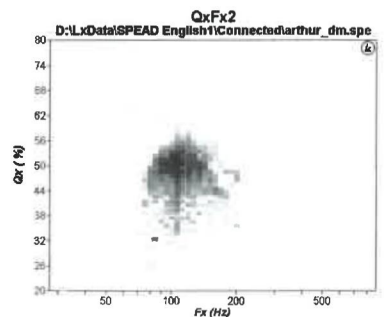
QUALITY REGULARITY

QxFx Cross plot of closed quotient vs fundamental frequency.
Scattergram of Qx vs Fx for every vocal fold cycle.



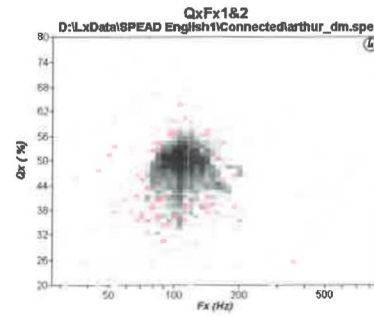
DYNAMIC RANGE OF VOICE QUALITY
WITH RESPECT TO PITCH

QxFx2 Second order cross plot of closed quotient vs fundamental frequency.
Scattergram of Qx vs Fx where consecutive values fall in the same 'bin'.



REGULARITY OF QUALITY OVER THE
PITCH RANGE

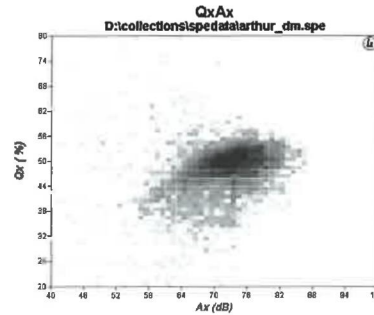
QxFx1&2 The first (red) and second (black) order scattergrams of Qx/Fx are superimposed on one graph.



QxAx Cross plot of closed quotient vs amplitude.

Scattergram of Qx vs Ax for every vocal fold cycle.

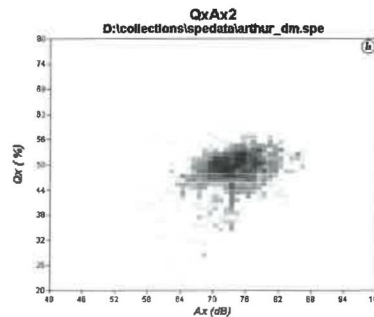
DYNAMIC RANGE OF QUALITY WITH RESPECT TO LOUDNESS



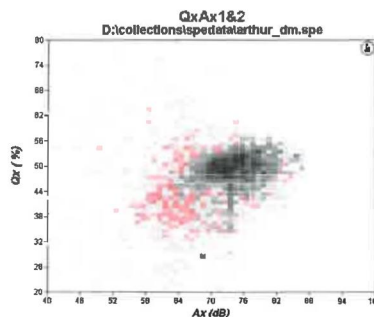
QxAx2 Second order cross plot of closed quotient vs amplitude.

Scattergram of Qx vs Ax where consecutive values fall in the same 'bin'.

REGULARITY OF QUALITY OVER THE LOUDNESS RANGE

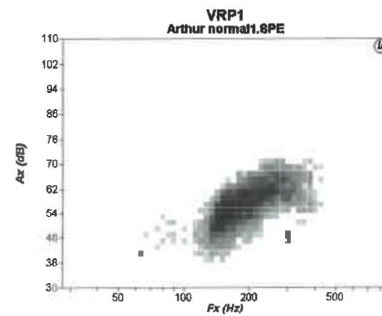


QxAx1&2 The first (red) and second (black) order scattergrams of Qx/Ax are superimposed on one graph.



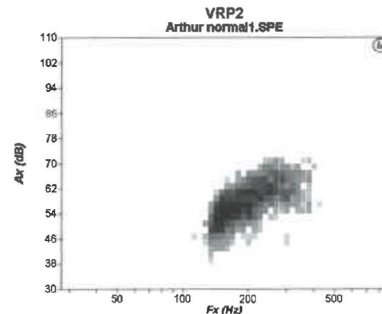
VRP1 1st order voice range profile
A simple phonetogram. Ax is plotted against Fx for each vocal fold cycle.

DYNAMIC RANGE OF LOUDNESS WITH RESPECT TO PITCH

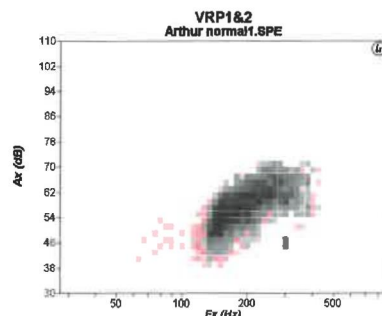


VRP2 2nd order voice range profile.
A second order phonetogram. Values of Ax and Fx where consecutive values fall in the same 'bin' are plotted against each other.

REGULARITY OF LOUDNESS OVER THE PITCH RANGE

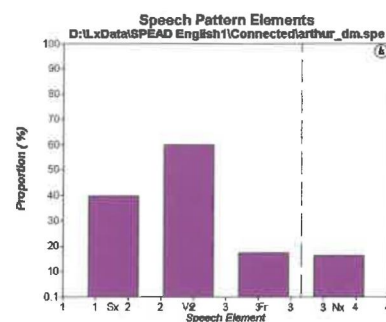


VRP1&2 The first and second order phonetograms are superimposed on one graph.



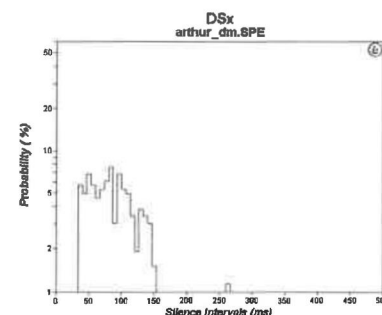
SPE Speech pattern element display.
The proportions of time spent in silence, voice, frication (and nasalance if enabled) are displayed as a bar graph.

FLUENCY



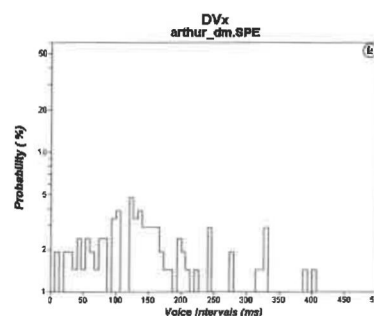
DSx Distribution of silence intervals
The distribution of the time intervals between each section of silence (non-voice).

FLUENCY



DSx Distribution of voice intervals
A distribution of the time intervals between each section of voice.

FLUENCY



Statistics

	Number of samples	Samples out of range (◇)	Mean	Mode	Median	Standard Deviation	80% range	90% range	Irregularity
DFx1 e	●	●	●	●	●	●	●	●	
DFx2	●	●	●	●	●	●	●	●	
CFx	●	●							●
DAx1	●	●	●	●	●	●	●	●	
DAx2	●	●	●	●	●	●	●	●	
CAx	●	●							●
DQx1	●	●	●	●	●	●	●	●	
DQx2	●	●	●	●	●	●	●	●	
QFx	●	●							
QFx2	●	●							
VRP1	●	●							
VRP2	●	●							

Sustained vowels analyses

File Name D:\LxData\SPEAD English1\Connected\arthur_dm.spe

Start at 0.662 s End at 0.726 s

No. Periods 7 Duration 0.064 s

Minimum Fx 109.11 Hz Maximum Fx 109.63 Hz

Average Fx 109.39 Hz S.D. Fx 0.17 Hz

Minimum Qx 42.57 % Maximum Qx 44.55 %

Average Qx 43.69 % S.D. Qx 0.14 %

Jitter First 0.15 % Jitter Second 0.09 %

Shimmer+ 1.59 % Shimmer- -1.50 %

Minimum HNR 31.45 dB Maximum HNR 31.45 dB

Average HNR 31.45 dB S.D. HNR 0.00 dB

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